

Chapter 1: The Roots of Artificial Intelligence

1. Most people in artificial intelligence trace the field's official founding to a small workshop in 1956 at Dartmouth College organized by a young mathematician. Who was this organizer?

John McCarthy

2. Which of the following were outcomes of the Dartmouth conference?

- (a) The field itself was named.
- (b) The general goals of the field were outlined.
- (c) The soon-to-be "big four" pioneers of the field – McCarthy, Minsky, Allen Newell, and Herbert Simon – met and did some planning for the future.
- (d) McCarthy, Minsky, Newell and Simon came out of the conference with tremendous optimism for the field.
- (e) All of the above.

E, All of the above

3. Who coined the phrase "suitcase word" for terms like intelligence and its many cousins, such as thinking, cognition, consciousness, and emotion – each of which is packed like a suitcase with a jumble of different meanings?

Marvin Minsky coined the term "Suitcase word"

4. True or False: Artificial Intelligence is a suitcase word.

True

5. In a notable 2016 report on a study of the current state of AI being conducted at Stanford University (AI100, for short), a committee of prominent researchers:

- (a) Defined the field as "a branch of computer science that studies the properties of intelligence by synthesizing intelligence."
- (b) Admitted that it's hard to define the field, but suggested that may be a good thing: "The lack of a precise, universally accepted definition of AI probably has helped the field to grow, blossom, and advance at an ever-accelerating pace."
- (c) Noted that: "Practitioners, researchers, and developers of AI are instead guided by a

rough sense of direction and an imperative to 'get on with it.'"
(d) All of the above.

D, All of the above

6. True or False: After observing that the diverse approaches to AI promoted at the Dartmouth conference (deductive reasoning, induction grounded in data, biologically inspired work) persist to this day, MM referenced an AI survey paper which suggested that: "Because we don't deeply understand intelligence or know how to produce general AI, rather than cutting off any avenues of exploration, to truly make progress we should embrace AI's 'anarchy of methods.'"

True

7. True or False: Since the 2010s, one family of AI methods – collectively called deep learning (or deep neural networks) – has risen above the anarchy to become the dominant AI paradigm. In fact, in much of the popular media, the term artificial intelligence itself has come to mean "deep learning." This is an unfortunate inaccuracy. AI is a field that includes a broad set of approaches, with the goal of creating machines with intelligence. Deep learning is only one such approach. Deep learning is itself one method among many in the field of machine learning, a subfield of AI in which machines "learn" from data or from their own "experiences."

True

8. What is symbolic AI? Simply characterize symbolic AI by describing the essential nature of a symbolic AI program.

Words or phrases understandable to a human along with rules by which the program can combine and process these symbols in order too perform its assigned task

9. True or False: The creators of the General Problem Solver, the cognitive scientists Herbert Simon and Allen Newell, had recorded several students "thinking out loud" while solving this ((Missionaries and Cannibals)) and other logic puzzles. Simon and Newell then designed their program to mimic what they believed were the students' thought processes.

True

10. How did GPS do its thing? That is, what was its procedure of operation?

It had an initial state and a goal state and every step of the procedure it used operators in order to reach the goal state.

11. Symbolic AI was originally inspired by mathematical logic as well as by the way people described their conscious thought processes. What, in contrast, inspired subsymbolic AI?

Subsymbolic AI took inspiration from neuroscience in an attempt to replicate subconscious human thought and functionality.

12. How does MM characterize a subsymbolic AI program?

“It is a stack of equations – a thicket of often hard-to-interpret operations on numbers”

13. True or False: The perceptron was an early example of a subsymbolic, brain-inspired AI program, was an important milestone in AI, and was the influential great-grandparent of modern AI’s most successful tool, deep neural networks.

True

14. A perceptron is a simple program that makes a yes-or-no (1 or 0) decision based on whether the sum of its weighted inputs meets a threshold value. What real life example is provided in the text as an analog the inner workings of a perceptron?

“You might get input from several friends on how much they liked a particular movie, but you trust some of these friends’ taste in movies more than others’. If the total amount of “friend enthusiasm” = giving more weight to your more trusted friends – is high enough, you decide to go to the movies.”

15. What example of visual perception via perceptron is explored in the pages of this chapter?

A perceptron that would scan a number the number 8

16. All of the “knowledge” of a perceptron is encoded in the numbers making up its weights and threshold. How did Rosenblatt suggest that these numbers be determined? He proposed that the perceptron should learn these values on its own. Please elaborate on this, telling a story that involves behavioral psychology and supervised learning.

Supervised learning would involve allowing a program to read an input and give an output. That program would then be given a signal signaling how close to a correct answer it was. This is like teaching students in school. A student is allowed to assert the answer they believe is true or accurate and a teacher will respond with a signal on how close that student was to the correct answer.

17. What was Frank Rosenblatt’s primary contribution to AI? (Please be more specific than to simply answer “the perceptron.”)

“Frank Rosenblatt’s primary contribution to AI was his design of a specific algorithm, called the perceptron-learning algorithm, by which a perceptron could be trained from examples to determine the weight and threshold that would produce correct answers”

18. Please REACT in two or three sentences to the following rather long passage that I have lifted from the text. “One might make a rough analogy between perceptrons and the human brain. If I could open up your head and watch some subset of your hundred billion neurons firing, I would likely not get any insight into what you were thinking or the ‘rules’ you used to make a particular decision. However, the human brain has given rise to language, which allows you to use symbols (words and phrases) to tell me – often imperfectly – what your thoughts are about or why you did a certain thing. In this sense, our neural firings can be considered subsymbolic, in that they underlie the symbols our brains somehow create. Perceptrons, as well as more complicated networks of simulated neurons, have been dubbed ‘subsymbolic’ in analogy to the brain. Their advocates believe that to achieve artificial intelligence, language-like symbols and the rules that govern symbol processing cannot be programmed directly, as was done in the General Problem Solver, but must emerge from neural-like architectures similar to the way that intelligent symbol processing emerges from the brain.”

I do agree that the neural architecture would not be constrained to symbols but uses more elemental methods to create bigger structures like thought itself. Until we, or an advanced AI can properly understand how and why the brain works as it does I doubt we will ever create an algorithm that would accurately emulate real human thought.

19. True or False: It wasn’t Minsky and Papert’s mathematics that put the final nail in the perceptron’s coffin; rather, it was their speculation on multilayer neural networks: “[The

perceptron] has many features to attract attention: its linearity; its intriguing learning theorem; its clear paradigmatic simplicity as a kind of parallel computation. There is no reason to suppose that any of these virtues carry over to the many-layered version. Nevertheless, we consider it to be an important research problem to elucidate (or reject) our intuitive judgment that the extension is sterile."

True

20. Who said "in general, we're least aware of what our minds do best" in support of his admonition that "easy things" for humans "are hard" for machines, and in focussing on this paradox illuminated the fact that the attempt to create AI has, at the very least, helped to elucidate how complex and subtle are our own minds?

Marvin Minsky